remote unit receives received symbols from a base station, each symbol including at least one packet and each packet including an address and a payload. The method involves determining whether a received symbol is a retransmitted symbol. If the received symbol is a retransmitted symbol and a stored symbol corresponding to the received symbol is stored at the remote unit, the received symbol and the stored symbol are soft-combined. The method also involves determining whether the address of each packet corresponding to the received symbol can be determined reliably. If the address of a packet can be determined reliably, the address of the packet is determined. Whether the address of the packet indicates that the remote unit is an intended recipient of the packet is also determined. If the remote unit is an intended recipient of the packet, the method involves the further steps of determining whether there is an error in the payload of the packet. It there is an error in the payload of the packet the method involves signalling to the base station that the packet is to be transmitted and storing the received symbol in a buffer. A remote unit in which the above method is implemented is shown in an exemplary embodiment of the invention in Figure 3 of the present application.

Sato *et al.*

With reference to Figure 2 of the Sato *et al.* reference, this reference discloses a retransmission control method. In particular, Figure 2 is a flow chart of the signalling between a base station and a radio terminal. At step S2 the base station transmits an OFDM (Orthogonal Frequency Division Multiplexing) data symbol to the radio terminal. At step S3 the radio terminal receives the OFDM symbol and detects whether there is an error. At step S4, if there is an error the radio terminal transmits a retransmission requirement signal to the base station (step S5). At step S7, the base station receives the retransmission requirement signal and a retransmitting OFDM data symbol is sent to the radio terminal at step S10 after a number of operations (steps S8 and S9). At step S11 the radio terminal receives the retransmitting OFDM data symbol, and at step S12 the radio terminal reproduces an original data sequence using the retransmitting OFDM data symbol (see column 7, line 5 to column 8, line 14 of the Sato *et al.* reference). In the Sato *et al.* reference an original data sequence is reproduced without the use of the originally received OFDM data symbol received at step S3, and the retransmitting OFDM data symbol simply replaces the originally received OFDM data symbol that was in error. There is no combining of a retransmitting OFDM symbol with an originally received OFDM data

symbol. This is achieved using a scrambling/descrambling technique described in column 7, lines 21 to 37 and lines 54 to 64; and column 8, lines 9 to14 of the Sato *et al.* reference.

Cupo *et al.*

The Cupo *et al.* reference discloses a method and receiver for reducing adjacent-channel interference to a digitally modulated received signal. In particular, the method and receiver of the Cupo *et al.* reference is applied to systems for commercial radio broadcasters which transmit in the frequency modulation (FM) band. In some modulations schemes digital side-bands are transmitted in a frequency region away from a carrier frequency of an analog portion of the FM signal providing an FM hybrid analog/digital signal. The analog portion of the signal may be filtered out so as not to interfere with the digital side bands. However, at the receiver, interference from adjacent FM analog or FM hybrid channels may corrupt or destroy the digital side-bands. The method and receiver of the Cupo *et al.* reference evaluates error rates of the received signal associated with different received bandwidths of the received signal. In the hybrid FM signal the received bandwidths are defined by the side-bands. The receiver selects a preferential bandwidth among the different bandwidths based on a suitably low error rate associated with the preferential bandwidth. With reference to Figure 2 of the Cupo *et al.* reference, shown is a frequency versus amplitude response for a hybrid digital/analog signal by a receiver. The signal includes an analog frequency modulation signal 54 which is centrally located between a digital upper side-band and a digital lower side-band 50. A digital upper side-band 52 and a lower side-band 50 contain multiple signal components, which may be referred to bins. The lower side-band 50 contains lower bin groups 58 while the upper side-band 52 contains upper bin group 60 (see column 4, lines 28 to 38 of the Cupo *et al.* reference). The bandwidth comprises the upper side-band 52 and the lower side-band 50. To reduce interference, a selector selects data bits representing a reduced bandwidth less than a full bandwidth by eliminating bins associated with the outermost frequency components of the full bandwidth (see column 5, lines 36 to 51 of the Cupo *et al.* reference). In this reference there is no OFDM data symbols being retransmitted as this is a broadcast system which, as described on page 2, lines 10 to 13 of the present application, can not tolerate delays arising from retransmission.

Claim 1

To begin, there are three requirements for establishing a *prima facie* case of obviousness; 1) all features must be present; 2) there must be an expectation of a reasonable chance of success; and 3) there must be some suggestion on motivation in the prior art to combine the references.

Claim 1 is directed to a method by a remote unit in a radio communication system which employs Orthogonal Frequency Division Multiplexing. The remote unit receives received symbols from a base station, each symbol including at least one packet and each packet including an address and a payload. Among other features, claim 1 recites:

"determining whether a received symbol is a retransmitted symbol".

With respect, the Examiner has not addressed this claim feature, and Applicant submits that this claim feature is not disclosed in any of the cited references. In particular, the Cupo *et al.* reference discloses a broadcasting system and there is no retransmitting of any symbols. Regarding the Sato *et al.* reference, there is also no disclosure of the above claim feature in this reference. In particular, the Sato *et al.* reference makes use of a scrambling technique which allows a radio terminal to replace an OFDM data symbol having an error with a retransmitted OFDM data symbol without having to determine whether a received symbol is a retransmitted symbol. In particular, with reference to Figure 2 of the Sato *et al.* reference, at step S1 a digital data sequence to be transmitted is input into a scrambler and scrambled according to a predetermined scramble sequence as part of the process of producing an OFDM data symbol (see column 7, lines 5 to 18 of the Sato *et al.* reference). At step S3, the radio terminal receives the OFDM data symbol and a descrambling process is followed (see column 7, lines 21 to 37 of the Sato *et al.* reference). At step S5, when an error has been detected a retransmission requirement signal is transmitted. The base station receives the retransmission requirement signal at step S7, and transmits a retransmitting OFDM data symbol at step S10; however, in this case the scramble sequence differs from the scramble sequence used prior to the retransmitting operation (see column 7, lines 54 to 63 of the Sato *et al.* reference). At step S11, the radio terminal receives the retransmitting OFDM data symbol, and at step S12 the radio terminal descrambles the retransmitting data sequence to reproduce the original data sequence (see column 8, lines 9 to 14 of the Sato *et al.* reference). With respect, at steps S3 and S12 the radio terminal performs descrambling and this descrambling is independent of whether what is being received is an original OFDM data symbol or a retransmitting OFDM data signal. This is achieved by having

the base station choose a different scrambling sequence when creating the retransmitting OFDM data symbol. As such, given that the radio terminal performs the same descrambling operation regardless of the type of OFDM data signal being received and that an OFDM data symbol in error is simply replaced by a retransmitting OFDM data symbol, at the radio terminal there is no need to determine (or indeed no knowledge of) whether a received symbol is a retransmitted symbol.

Claim 1 also recites:

"determining whether the address of each packet corresponding to the received symbol can be determined reliably".

With regard to this claim feature, the Examiner states "note that the remote unit would need to know if it is the intended recipient when deciding whether to accept the packet". With respect, Applicant does not contend that the remote unit would not need to know if it is the intended recipient when deciding whether to accept the packet; however, this is not what is contemplated in the above claim feature. In particular, the above step involves determining whether the address of each packet corresponding to the received symbol can be determined reliably. This is different than determining the address of a packet to decide whether to accept the packet in that in the Sato *et al.* reference there is no consideration being made as to whether the address can be determined reliably.

Claim 1 also recites:

"if the address of a packet can be determined reliably, the further steps of:

determining the address of the packet;

determining whether the address of the packet indicates that the remote unit is an intended recipient of the packet; and

if the remote unit is an intended recipient of the packet, the further steps of:

determining whether there is an error in the payload of the packet; and

if there is an error in the payload of the packet, the further steps of:

signalling to the base station that the packet is to be retransmitted; and

storing the received symbol in a buffer."

As discussed above, in the Sato *et al.* reference there is no disclosure of "determining whether the address of each packet corresponding to the received symbol can be determined reliably", and therefore, there can be no disclosure of the steps of this claim feature being performed based on the condition that the address of a packet can be determined reliably.

Furthermore, this claim feature refers to a packet which is a packet corresponding to a received symbol. In the Sato *et al.* reference there is no mention of any packets, and reference is made to symbols only and to detection of errors in the symbols. The Sato *et al.* reference does not specifically disclose what kind of errors are detected. There are different kinds of errors that can be detected in a symbol, and Applicant cannot find in the Sato *et al.* reference any disclosure of "determining whether there is an error in the payload of a packet".

In addition, regarding the step of "signalling to the base station that the packet is to be re-transmitted", as discussed above the Sato *et al.* reference does not provide any disclosure of any packets within a symbol. Instead, any signalling made by the radio terminal to the base station is a retransmission requirement signal as shown at step S5 of Figure 2 of the Sato *et al.* reference. This retransmission requirement signal is a request for a retransmitted OFDM symbol and <u>not</u> a request that "a <u>packet</u> be retransmitted". Applicant emphasizes that there is a clear distinction to be made between the request for retransmission of a packet and a request for retransmission of a symbol. In particular, by signalling to the base station that the packet is to be retransmitted, this allows the base station to retransmit the packet as part of a symbol which is different than the original symbol containing the original packet with an error in its payload, thereby allowing the base station to save transmission resources (see page 13, line 20 to page 14, line 3 of the present application).

None of the features discussed above is disclosed or suggested by the admitted prior art.

Thus, the claim features of claim 1 are not all disclosed by the cited references and by the admitted prior art, and requirement 1) for a *prima facie* case of obviousness is not satisfied.

Regarding requirement 2), given that the claim features of claim 1 are not all disclosed by the cited references and admitted prior art, Applicant cannot see how the cited references can be combined to produce the desired result of the invention. In particular, claim 1 recites:

"if the received symbol is a retransmitted symbol and a stored symbol corresponding to the received symbol is stored at the remote unit, performing soft-combining of the received symbol and the stored symbol".

As discussed above, in the Sato *et al.* reference the radio terminal has no knowledge of whether an OFDM data symbol is an original OFDM data symbol or a retransmitted OFDM data signal and there is no determining whether a received symbol is a retransmitted symbol. In addition, the Cupo *et al.* reference has nothing to do with retransmission of symbols and therefore none of the references cited by the Examiner teach how a remote unit can know if a received symbol is a retransmitted symbol. Applicant therefore fails to see how "soft-combining of the received symbol and a stored symbol" can be performed on the basis of whether a received symbol is a retransmitted symbol without any teaching of how to determine whether a received symbol is a retransmitted symbol.

Regarding requirement 3), the Sato *et al.* reference and the Cupo *et al.* reference solve completely different problems, and Applicant fails to see how there can be any suggestion or motivation in the prior art to combine the references. In particular, the Cupo *et al.* disclosure has to do with broadcast systems in which there is no retransmission of symbols. Applicant fails to see how one of skill in the art having knowledge of the Sato *et al.* reference would look to the Cupo *et al.* reference, which deals specifically with broadcasting systems, when it is well known that broadcast systems do not use retransmission protocols such as those found in the Sato *et al.* reference because they can not tolerate delays arising from retransmission (see page 2, lines 1 to 14 of the present application). As such, requirement 3) is also not satisfied.

Thus, none of the requirements for a *prima facie* case of obviousness are satisfied.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claim 1.

Claims 5 and 9

Independent claims 5 and 9 should be allowed for the same reasons as discussed above with reference to claim 1 with the exception of the discussion in connection with the claim feature "signalling to the base station that the packet is to be transmitted" of claim 1, which is not recited in either claim 5 or claim 9.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claims 5 and 9.

Claim 13

Claim 13 is directed to a processor in a remote unit for a radio communication system which employs Orthogonal Frequency Division Multiplexing, and among other features recites:

"determining whether a received symbol is a retransmitted symbol".

As discussed above with reference to claim 1, this feature is not disclosed in the cited references, and requirement 1) for a *prima facie* case of obviousness is not satisfied.

Requirements 2) and 3) are also not satisfied for the same reasons as discussed above with reference to claim 1.

Thus, none of the requirements for a *prima facie* case of obviousness are satisfied.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claim 13.

Claim 15

Claim 15 is directed to processor in a remote unit for a radio communication system and should be allowed for the same reasons discussed above with reference to claim 1 with respect to the claim features "determining whether the address of a packet can be determined reliably"; "determining whether there is an error in the payload of the packet"; "signalling to a transmission encoder that a packet is to be retransmitted...".

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claim 15.

Claim 3

Claim 3 depends on claim 1 and should be allowed for the same reasons as discussed above with reference to claim 1.

Furthermore, claim 3 recites the additional claim feature:

"wherein the step of signalling to the base station that the packet is to be retransmitted includes transmitting a retransmission request, the retransmission request including a packet identifier and a symbol identifier".

With respect, as discussed above with reference to claim 1, in the Sato *et al.* reference when an error in a data symbol is detected the data symbol is retransmitted, and there is no disclosure of any packet nor any "retransmission request including a packet identifier". In particular, Sato *et al.* have failed to realize that within a symbol there can possibly be only one packet that has an error thereby requiring only the packet to be retransmitted as opposed to the entire symbol.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claim 3.

Claim 4

Claim 4 depends on claim 1, and should be allowed for the same reasons as discussed above with reference to claim 1. The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claim 4.

Claims 7 and 8

Claims 7 and 8 depend on claim 5 and should be allowed for the same reasons as discussed above with reference to claim 5. Furthermore, claim 7 should be allowed for the same reasons as discussed above with reference to claim 3.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claims 7 and 8.

Claims 11 and 12

Claims 11 and 12 depend on claim 9 and should be allowed for the same reasons as discussed above with reference to claim 9. Furthermore, claim 11 should be allowed for the same reasons as discussed above with reference to claim 3.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claims 11 and 12.

Rejection of Claims 2, 6, 10, and 14

In paragraph 3 of the Detailed Action, the Examiner has rejected claims 2, 6, 10, and 14 under 35 U.S.C. 103(a) as being unpatentable over the Sato *et al.* reference in view of the Cupo *et al.* reference and Applicant's admitted prior art, and further in view of United States Patent No. 6,418,143 (Rezaiifar *et al.*). Given below is a brief description of the Rezaiifar *et al.* reference followed by a detailed discussion on how claims 2, 6, 10, and 14 are patentable over the above cited references.

Rezaiifar *et al.*

The Rezaiifar *et al.* reference discloses a method and apparatus for extending a sequence numbering range for a selective repeat transmission protocol. Data frames are transmitted including an eight-bit sequence number and a one-bit retransmit flag. The one-bit retransmit flag indicates whether the frame is newly transmitted or retransmitted due to a failed first transmission. Transmit and receive systems each maintain a twelve-bit sequence number referred to as "long sequence numbers" comprised of the eight-bit sequence number transmitted with each frame and a four-bit extension. The long sequence number is transmitted within control frames and the eight-bit sequence number is transmitted within the data frames.

Claims 2, 6, 10, and 14

Claims 2, 6, 10, and 14 depend on claims 1, 5, 9, and 13, respectively, and should be allowed for the same reasons as discussed above with reference to claims 1, 5, 9, and 13. In particular, claims 2, 6, 10, and 14 contain all of the claim limitations of claims 1, 5, 9, and 13, respectively, and as discussed above with reference to claims 1, 5, 9, and 13 there is no

disclosure in the Sato *et al.* and Cupo *et al.* references and the Applicant's admitted prior art that renders claims 1, 5, 9, and 13 obvious. Applicant submits there is no additional disclosure in the Rezaiifar *et al.* reference that renders claims 1, 5, 9, and 13 obvious. The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claims 2, 6, 10, and 14.

Rejection of Claim 28

In paragraph 4 of the Detailed Action, the Examiner has rejected claim 28 under 35 U.S.C. 103(a) as being unpatentable over the Sato *et al.* reference in view of United States Patent No. 6,359,877 (Rathonyi *et al.*). Given below is a brief description of the Rathonyi *et al.* reference followed by a discussion on how claim 28 is patentable over the Sato *et al.* and Rathonyi *et al.* references.

Rathonyi *et al.*

The Rathonyi *et al.* reference discloses a method and apparatus for minimizing overhead in packet retransmission in a communication system. Each packet is given a sequence number, based on a current transmission rate, the size of the packet, and a previously assigned sequence number. The packet size can be adapted so that the entire packet fits into a single transmission block. The packet size may be adapted based on the transmission rate and/or throughput, and whether the packet is being transmitted the first time or if it is being retransmitted. Alternatively, if the packet is being retransmitted, the packet is transmitted at its original transmission rate, regardless of the current transmission rate. With respect, this reference discloses packet transmission and has nothing to do with OFDM systems nor anything to do with transmission of symbols used in OFDM systems.

Claim 28

Claim 28 is directed to a processor in a base station for a radio communication system which employs Orthogonal Frequency Division Multiplexing, and recites:

"generating a symbol serial number from timing information; and

encoding a symbol from at least one packet, a retransmission indicator bit, and the symbol serial number".

With respect, in the rejection of claim 28 the Examiner has not addressed the feature of "encoding...a retransmission indicator bit"; however, the Examiner has made it clear that the use of a retransmission indicator bit is not disclosed in the Sato *et al.* reference. In particular, with reference to paragraph 3 of the Detailed Action, in the rejection of claims 2, 6, 10, and 14 the Examiner states "Sato *et al*/Cupo *et al*/AAPA Applicant's Admitted Prior Art teach the invention as described above, but do not teach the use of a retransmission bit". Furthermore, Applicant submits that there is no disclosure of "encoding...a retransmission indicator" bit in the Rathonyi *et al.* reference.

As such, requirement 1) for a *prima facie* case of obviousness is not satisfied.

Regarding requirement 2), since none of the cited references disclose "encoding...a retransmission indicator bit" there can be no possible combination of the cited references that produces the desired result of the invention, and this requirement is also not satisfied.

Regarding requirement 3), the Examiner admits that the Sato *et al.* reference does not "teach generating a symbol serial number from timing information". However, the Examiner states "Rathonyi *et al.* teach generating a sequence number (similar to a serial number) through the use of changes of rate information delivery in time. See col 9 lines 34+. It would have been obvious to one of ordinary skill in the art at the time of the invention to have numbered the packets of Sato *et al.* through the use of timing information in light of the teachings of Rathonyi *et al.* in order to help assure an ordered delivery of information in the communication system".

With respect, the Examiner is incorporating the teachings of the Rathonyi *et al.* reference, which has nothing to do with OFDM systems nor symbols but instead discloses retransmission of packets, into the OFDM system of the Sato *et al.* reference. Claim 28 specifically recites "encoding a symbol from at least one packet". The packets of the Rathonyi *et al.* reference are given a sequence number (see abstract of the Rathonyi *et al.* reference) and combining the teachings of the Rathonyi *et al.* reference with those of the Sato *et al.* reference results in a packet being given a sequence number. This is different than what is contemplated in claim 28 where a symbol serial number is generated from timing information as opposed to a packet serial number being generated. In particular, Applicant emphasizes that there is a difference between timing of

symbols and timing of packets. As such, the combination proposed by the Examiner can not produce the desired result of the invention as claimed in claim 28, and requirement 2) for a *prima facie* case of obviousness is again not satisfied.

Thus, not all of the requirements for a *prima facie* case of obviousness are satisfied.

The Examiner is respectfully requested to withdraw the 35 U.S.C. 103(a) rejection of claim 28.

Finally, Applicant notes that in paragraph 5 of the Detailed Action claims 16 to 27 and 29 are indicated as being allowed.

The Examiner is respectfully requested to pass this application to allowance but, if there are any outstanding issues, the Examiner is respectfully requested to telephone the undersigned.

Respectfully submitted,

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